

## IRRIGATION WATER MANAGEMENT PLAN

**DATE:** February 23, 2009

**COOPERATOR:** I. M. Sample

**LOCATION:** Sample Farm, Sample County

**FIELD NUMBERS:** 1 (see attached maps)

**CROP:** Soybeans

**GROWING SEASON:** April 15 – August 30

**ROOTING DEPTH:** 24 in

**PEAK CONSUMPTIVE USE RATE:** 0.25 in/day

**IRRIGATION SYSTEM:** Center pivot (360 degree) - 1990' span length, End Gun Radius = 98' and 122 gpm, Total Acres – 315, Pivot pressure = 45 psi, Capacity = 1900 GPM, 6.04 GPM/Acre, 40 ft highest elev, 0.0 lowest elevation.

**WATER SUPPLY:** Well

**PREDOMINANT SOIL SERIES:** Loring Silt Loam, Adler

### OBJECTIVE

A well designed and managed irrigation system reduces water loss to evaporation, deep percolation, and runoff and minimizes erosion from applied water. Application of this plan will reduce the waste of irrigation water, improve water use efficiency, and reduce the total pollutant discharge from an irrigation system. It focuses on components to manage the timing, amount and location of water applied to match crop water needs, and special precautions (i.e., backflow preventers, prevent runoff, and control deep percolation) when chemigation is used.

### IRRIGATION WATER MANAGEMENT PLAN ACCEPTANCE

I/we have reviewed and do accept the attached plan. I/we agree to implement this plan for the life of the practice, including the attached Operation and Maintenance Plan for the crop year identified in the plan. I/we recognize that this is a management plan that should be reviewed and updated annually, with the help of a qualified technical specialist.

Landowner Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Developed by: \_\_\_\_\_ Date: \_\_\_\_\_

Tech Reg Cert. No. \_\_\_\_\_

**CURRENT MANAGEMENT PRACTICE:** None

**RECOMMENDATIONS:**

The most important aspect of irrigation water management is properly evaluating and monitoring the available soil moisture for the particular crop. By observing moisture levels in the soil, the operator can determine how long and how much water to apply. The landowner will be using one of the following methods to evaluate moisture. Use of tensiometers, electrical resistance blocks, neutron gauge, or feel and appearance methods are acceptable. See attached feel and appearance worksheets.

The system is designed to meet peak consumptive use for soybeans on 315 acres.

Moisture should always be available above the Management Allowable Depletion (MAD) level for the planned crops. MAD is defined as 50% of available water capacity in the root zone. The critical period for soybeans is pod filling and for corn is from tasseling through silk stage until the kernels become firm for corn. As part of this plan, the soil moisture will be checked and recorded to determine how much irrigation water should be applied for each irrigation.

For planned crop yield, irrigation should commence when the available soil moisture drops below the MAD. See Table 1 for how long to operate the system for various rooting depths and a MAD of 50%.

The irrigation system should be checked periodically to ensure proper operation of the pump, pipeline and sprinklers. No puddling or runoff should occur in the system. A visual inspection should be performed during operation to determine if any puddling or other irrigation-induced erosion is occurring. If so, increase the speed of the center pivot and the frequency of irrigation until no erosion occurs.

Table 2 provided by manufacture is used to determine the time required per revolution, gross application and net application for various dial settings.

Table 3 provides a sample of irrigation scheduling records to keep for monitoring soil moisture and depletion levels. If there is change in the soil moisture monitoring method or irrigation method, contact the NRCS field office. Additional records to keep are listed in Summary section.

**TABLE 1****Operating Times for Various Rooting Depths and 50%MAD**

Crop	Rooting Depth (inches)	<sup>1/</sup> AWC (in)	<sup>2/</sup> MAD (in)	<sup>3/</sup> Gross Application Irrigation (in)	Critical Irrigation Period	Gross Application Amount per revolution (in)	<sup>4/</sup> Dial Setting	<sup>4/</sup> Time per Run (hours)	<sup>5/</sup> Net Application Amount (in)	<sup>6/</sup> No. of Runs to achieve Gross
Soybean	24"	5.3	2.65	2.65	Pod growth and seed fill	0.7	31.1	52.4	0.6	4

<sup>1/</sup> Available Water Capacity within the root zone (AWC).<sup>2/</sup> Management Allowable Depletion (MAD)<sup>3/</sup> Application depth necessary to replace water used by crop at 50% MAD assuming an application efficiency of 85%<sup>4/</sup> Calculated from manufacturer's data. This should be re-calculated after checkout or evaluation. Also, divide by 2 for half circle pivots<sup>5/</sup> Refer to manufacturer's data (pivot application chart)<sup>6/</sup> Irrigation water should be applied so as not to puddle or runoff. In most cases it will take more than 1 revolution to accomplish gross application amount when moisture level in soil is depleted to 50%.**TABLE 2****Pivot information provided by manufacture**

Gross Application inches per 360 degrees (in.)	Pivot % Timer	Hours per 360 degrees
0.218	100.0	16.3
0.30	72.5	22.5
0.40	54.4	30.0
0.50	43.5	37.5
0.60	36.3	44.9
0.70	31.1	52.4
0.80	27.2	59.9
0.90	24.2	67.4
1.0	21.8	74.8
1.25	17.4	93.7

**TABLE 3**

Format for estimating the net amount of water needed for an irrigation using the feel and appearance method to measure soil moisture.

1	2	3	4	5	6
Depth feet	Soil Series <u>Lexington</u> texture	Available Water Capacity inches	Soil Water Content Before Irrigation		Soil Water deficiency inches
			percent	inches	
0-1	Silt Loam	2.64			
1-2	Silt Loam	2.64			
Total		5.28			

Column 1, the depth increment sampled.

Column 2, the soil texture of the sample.

Column 3, the available water capacity based on the texture of the sample.

Column 4, the percent of soil water content (remaining)

0-25% - AWC - Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure.

25-50% - AWC - Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remains on fingers.

50-75% - AWC - Moist, forms a weak ball with loose and aggregated sand grains, darkened color, moderate water staining on fingers, will not ribbon.

75-100% - AWC - Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon.

100% - AWC - Wet, forms a weak ball, moderate to heavy soil/water coatings on fingers, wet outline of soft ball remains on hand.

Column 5, Column 3 x Column 4, the soil-moisture balance, inches.

Column 6, Column 3 - Column 5, soil-moisture deficiency or net irrigation requirement.

See the United States Department of Agriculture, Natural Resource Conservation Service, *Estimating Soil Moisture by Feel and Appearance* (Program Aid 1619) at the end of this section.

## Summary

Irrigation water management is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner. The intent of this plan is to assist the irrigation manager to meet the following goals: manage soil moisture to promote the desired crop response, optimize use of available water supplies, decrease non-point source pollution of surface and groundwater resources, and manage air, soil, and plant micro-climates.

At a minimum, irrigation water management for crop production will consist of monitoring soil moisture to determine the timing of irrigations through the growing season, and developing an understanding of irrigation system performance to determine the duration of irrigations. In order to implement proper irrigation water management, the following records will be kept during the growing season on a daily or weekly basis (information in excel spreadsheet MOIST available at <http://bioengr.ag.utk.edu/weather/>):

Date	Actual Daily crop ET (in)	Forecast crop ET (in)	Cumulative total ET (in)	Rainfall (in)	Irrigation applied (in)	Cumulative total irrigation (in)	Soil water content (in)	Allowable depletion balance (in)
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Table 1 summarizes the benchmark conditions and typical or recommended operating conditions for your irrigation system. Use this information to determine the duration of irrigations. Additional information is included in the *Operations and Maintenance* plan to assist you in determining when to irrigate.

Additional Requirements:

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## Operation and Maintenance Plan

### System Maintenance

A properly operated, maintained, and managed irrigation system is an asset to your farm. Your system was designed and installed to apply irrigation water to meet the needs of the crop without causing erosion, runoff, or losses to deep percolation. The estimated life span of a new system is 15 years. The life of the system can be assured and usually increased by carrying out a good operation and maintenance program.

Operate and maintain the system to the specifications as designed, including those listed on the *Table 1* of this plan. Consult the proper technical specialist and NRCS before making changes to these specifications.

Make sure that all measuring devices, valves, nozzle heads, surface pipeline, and other mechanical parts of the system are checked periodically, and worn or damaged parts are repaired or replaced as needed. Always replace a worn or improperly functioning nozzle with the design size and type. Nozzle heads operate efficiently and provide uniform application when they are plumb, in good operating condition, and operated at the planned pressure. Maintain all pumps, piping, valves, and electrical and mechanical equipment in accordance with manufacturer recommendations. Check and clean screens and filters as necessary to prevent unnecessary hydraulic friction loss and to maintain water flow necessary for efficient pump operation. When chemigation is used, include backflow preventers for wells.

Protect pumping plant and all associated electrical and mechanical controls from damage by rodents, insects, heat, water, flooding, lightning, sudden power failure, and sudden water source loss. Provide and maintain good surface drainage to prevent water ponding around pump and electrical equipment. Ensure that all electrical/gas fittings are secure and safe. Always replace worn or excessively weathered electric cables and wires and gas tubing and fittings when first noticed. Check periodically for undesirable stray currents and leaks. Display appropriate bilingual operating instructions and warning signs as necessary. During non-seasonal use, drain pipelines and valves, and secure and protect all movable equipment.

Pollution hazards to ground and surface water can be minimized when good irrigation water management practices are followed. Losses of irrigation water to deep percolation and runoff should be minimized. Deep percolation and runoff from irrigation can carry nutrients and pesticides into ground and surface water. Avoiding spills from agricultural chemicals, fuels, and lubricants will also minimize potential pollution hazards to ground and surface water.